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*Indian Standard*  
SPECIFICATION FOR  
STEEL WIRE FOR NIPPLES FOR SPOKES

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# Indian Standard

## SPECIFICATION FOR STEEL WIRE FOR NIPPLES FOR SPOKES

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# *Indian Standard*

## SPECIFICATION FOR STEEL WIRE FOR NIPPLES FOR SPOKES

### 0. F O R E W O R D

**0.1** This Indian Standard was adopted by the Indian Standards Institution on 2 August 1977, after the draft finalized by the Wrought Steel Products Sectional Committee had been approved by the Structural and Metals Division Council.

**0.2** Conventionally, nipples made of brass are being used for spokes. Due to the acute shortage of copper in the country and also with a view to conserve this material for still more essential uses, the spoke industry has suggested the use of steel nipples in place of brass nipples. This standard covers the raw material required for nipples made of steel and it is hoped, this will give the necessary guidance to manufacturers and users.

**0.3** For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960\*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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### 1. SCOPE

**1.1** This standard covers the requirements for steel wires for nipples for spokes.

### 2. TERMINOLOGY

**2.1** For the purpose of this standard, the definitions given in IS : 1956 (Part V)-1976† shall apply.

\*Rules for rounding off numerical values (*revised*).

†Glossary of terms relating to iron and steel: Part V Bright steel bar and steel wire (*first revision*).

### **3. SUPPLY OF MATERIAL**

**3.1** General requirements relating to supply of material shall conform to IS : 1387-1967\*.

**3.2** The wire shall be supplied in drawn condition.

### **4. MANUFACTURE**

**4.1** The wire shall be manufactured from steel made by open-hearth, electric, duplex, basic oxygen or a combination of these processes. In case any other process is employed for the manufacture of steel by the manufacturer, prior approval of the purchaser should be obtained. If basic oxygen process is employed for manufacture, the nitrogen content of the steel shall not exceed 0·007 percent.

**Note**—The nitrogen content shall be ensured by the manufacturer by occasional product analysis.

**4.2** A sufficient discard shall be made from each ingot to ensure freedom from piping, segregation and other harmful defects.

**4.3** The ingots, blooms or billets shall be rough machined, chipped, ground or otherwise prepared to remove all surface imperfections likely to produce defects in the finished wire.

### **5. CHEMICAL COMPOSITION**

**5.1** The ladle analysis of steel when analysed in accordance with appropriate parts of IS : 228† shall have the chemical composition as given below:

<i>Constituent</i>	<i>Percent</i>
Carbon	0·07-0·15
Silicon, <i>Max</i>	0·1
Manganese	0·90-1·20
Sulphur	0·25-0·35
Phosphorus, <i>Max</i>	0·07
Lead	0·15-0·30
Tellurium	0·015-0·040

**5.2 Product Analysis** — Permissible variation in case of product analysis

\*General requirements for the supply of metallurgical materials (*first revision*).  
†Methods of chemical analysis of steel (*second revision*) (being issued in parts).

from the limits specified under 5.1 shall be as follows:

<i>Constituent</i>	<i>Permissible Variation Percent, Max</i>
Carbon	$\pm 0.02$
Silicon	$+ 0.03$
Manganese	$\pm 0.04$
Sulphur	$\pm 0.005$
Phosphorus	$+ 0.005$
Lead	$\pm 0.05$
Tellurium	$\pm 0.005$

**Note** — Variations shall not be applicable both over and under the specified limits in several determinations in a heat.

## 6. NOMINAL WIRE DIAMETER AND TOLERANCES

6.1 Steel wire for nipples for spokes shall be supplied in sizes of 3.5 to 4.0 mm.

6.1.1 Wires may be supplied in other sizes also as agreed to between the purchaser and the manufacturer.

6.2 The tolerance on the nominal wire diameter shall be  $\pm 1$  percent.

6.3 The cross-section of the round wire shall be circular to within half the tolerances of the permitted diameter tolerances.

## 7. TESTS

7.1 **Tensile Test** — When tested in accordance with IS : 1521-1972\* the material shall have the tensile strength of 490 to 640 N/mm<sup>2</sup> ( 50 to 65 kgf/mm<sup>2</sup> ).

7.2 **Bend Test** — The wire when tested in accordance with IS : 1716-1971† shall withstand without sign of failure, being bent forward and backward three times through 180° over a diameter equal to six times the wire diameter, the first bend of 90° not being counted.

7.3 **Hardness Test** — The hardness value of steel wire, when determined in accordance with IS : 1501-1968‡ shall be 240 HV *Max*.

\*Method for tensile testing of steel wire (*first revision*).

†Method for reverse bend testing of steel wire (*first revision*).

‡Method for Vickers hardness test for steel (*first revision*).

#### 7.4 Dump Test

**7.4.1** One dump test shall be made from the finished steel for every 25 tonnes of the cast or part thereof.

**7.4.2** The test piece having a length equal to twice its diameter cut from the wire after suitable end discard, shall at room temperature withstand without fracture or shall not reveal any crack while being compressed to half its length.

**7.4.2.1** Minor surface flaws which do not tend to open out wider than  $0.5 \text{ mm} \pm 0.05$  times the diameter of the wire shall not be the cause for rejection. For special applications, the limit of minor defects shall be as agreed to between the purchaser and the manufacturer.

### 8. FREEDOM FROM DEFECTS

**8.1** The wire shall be circular in section and free from surface defects, piping or harmful segregation. The wire shall be so processed during manufacture that it lies flat in coils of even diameter and free from cork screw, set and twist effect.

### 9. PACKING AND MARKING

**9.1** Each coil of wire shall be bound and fastened compactly and shall have a tag legibly marked with the following:

- Name of the manufacturer, and
- Type and size of the wire.

**9.2** The material may also be marked with the ISI Certification Mark.

**NOTE** — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

### 10. SAMPLING AND CRITERIA FOR CONFORMITY

**10.1** The method of drawing representative samples of the material and the criteria for conformity shall be as prescribed in Appendix A.

## APPENDIX A

*(Clause 10.1)*

### SAMPLING AND CRITERIA FOR CONFORMITY

#### **A-1. LOT**

**A-1.1** In any consignment, all the coils of wire of the same grade and diameter manufactured under essentially similar conditions of manufacture, shall be grouped together to constitute a lot.

**A-1.1.1** Samples shall be taken from each lot and tested for conformity to the standard.

#### **A-2. SAMPLING**

**A-2.1** The number of coils to be taken from a lot shall be as given in col 1 and 2 of Table 1. These samples shall be taken at random by using number tables (*see IS : 4905-1968\**).

**TABLE 1 SCALE OF SAMPLING AND PERMISSIBLE NUMBER OF DEFECTIVES**

*(Clauses A-2.1, A-3.1 and A-3.2)*

NO. OF COILS IN A LOT	NO. OF COILS FOR PHYSICAL REQUIREMENTS	PERMISSIBLE NO. OF DEFECTIVES	NO. OF TESTS FOR CHEMICAL REQUIREMENTS
(1)	(2)	(3)	(4)
Up to 25	8	0	2
26 , , 50	13	1	3
51 , , 150	20	2	5
151 , , 300	32	3	8
301 and above	50	5	8

#### **A-3. PREPARATION OF SAMPLES AND NUMBER OF TESTS**

**A-3.1 Test for Physical Requirements** — From the coils selected from col 1 and 2 of Table 1, adequate length of test piece shall be cut from each end and subjected to physical tests, namely, size, surface condition, tensile bend, hardness and dump tests. A test piece failing to meet any one of the requirements, shall be called a defective. If the number of defectives found, is less than the number of permissible number of defectives specified in col 3 of Table 1, the lot shall be considered to have conformed to physical requirements, otherwise not.

\*Methods for random sampling.

**A-3.2 Tests for Chemical Requirements —** Unless otherwise agreed, the following procedure shall be followed for chemical requirements.

From those test pieces which have conformed to physical requirements, further test pieces shall be selected at random as given in col 4 of Table 1. These samples shall be tested for all the chemical requirements. If a test piece fails to meet the respective chemical requirement, it shall be called a defective. The lot shall be considered to have conformed to the chemical requirements, if all the individual test pieces tested for chemical requirements pass the test, otherwise not.

#### **A-4. CRITERIA FOR CONFORMITY**

**A-4.1** A lot shall be considered to have conformed to the requirements of the specification if **A-3.1** and **A-3.2** are satisfied.